Landsat Program

LandsatConfiguration Control Board (LCCB)
Configuration Management Plan

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Landsat Program
Configuration Management Plan

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Abstract

On October 1, 2000, the management of the Landsat 7 Mission Operations Center and end-to-end mission configuration management responsibilities transitioned from the National Aeronautics and Space Administration (NASA) to the U.S. Geological Survey (USGS). In support of these new responsibilities, the USGS drafted this document to outline the Landsat Program's configuration management plans and procedures. The guidelines presented in this document along with the associated *Landsat Configuration Control Board Charter* and *Landsat Configuration Change Process* provide the overall framework by which the USGS will manage the configuration of the Landsat Program segments and their associated systems. This document will be updated as necessary by the Landsat Configuration Control Board (LCCB) to allow the board to effectively serve the CM needs of the Landsat Program.

Keywords: *Configuration Control Board (CCB), Configuration Management Plan, Landsat Program, U.S. Geological Survey (USGS).*

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Section 1.0 - Introduction

1.1 Purpose and Scope

This Configuration Management Plan (CMP) establishes the Configuration Management (CM) guidelines used by the Landsat Program. This CMP outlines the mission level CM activities and describes the processes to control all mission level configuration items—specifically the documents that delineate the Program's mission level requirements, directives, agreements, policies, interfaces and procedures.

As part of the Landsat Program's CM approach, the Program has established the Landsat Configuration Control Board (LCCB) and the LCCB's technical arm, the Landsat Intersegment Technical Assessment Panel (LITAP). The LCCB's primary purpose is to manage the configuration of the Landsat Program's segments and coordinate the implementation of all intersegment changes. An intersegment change is defined as a form, fit or function change involving more than one Landsat operational segment. Furthermore, the LCCB is responsible for the management of interfaces between Landsat segments and external organizations. The following operational segments support the Landsat Program, LCCB, and LITAP:

- Landsat Program Manager / Mission Management Officer (LCCB & LITAP Chair).
- Data Handling Facility Configuration Control Board (DCCB) (representing the Landsat 7 Ground System (LGS), Landsat 7 Processing System (LPS), Image Assessment System (IAS), Landsat 7 Product Generation System (LPGS), and the Mission Management Office Database System (MDS)).
- Earth Sciences Mission Operations (ESMO) (also represents the Ground Network (GN) and the Tracking and Data Relay Satellite System (TDRSS)).
- EROS Data Center (EDC) Archive Services (representing the Earth Explorer system).
- EDC Production Services (representing the National Land Archive Processing System (NLAPS), the Distributed Ordering, Reporting, Research and Accounting Network (DORRAN) System, and the Product Distribution System (PDS)).
- EDC Distributed Active Archive Center (DAAC).
- Landsat Project Science Office (LPSO).
- Landsat 5 Mission Operations Center (MOC).
- Landsat 7 Mission Operations Center (MOC).
- LCCB Administrator (non-voting).

This CMP addresses the activities associated with the LCCB and LITAP. It is expected that the above listed operational segments will operate their own CCBs to manage intrasegment issues. These lower tier CCBs will then raise intersegment issues to the LCCB. While this document does not specifically address the activities of these lower tier CCBs, they will be responsive in supporting the LCCB and LITAP activities.

1.2 Objectives

The Landsat Program's CM approach allows configuration items to be changed in support of mission operations in a controlled fashion to ensure all impacts are considered. Furthermore, the CM approach described in this document and those listed in Section 1.3 provides the flexibility

and responsiveness necessary to support the highly dynamic nature of satellite operations and data archiving and production. Emergency and urgent changes will move through the required steps in a more expeditious manner than will routine changes. However, it is important to remember that all of the steps still must be completed to ensure a proper audit trail exists for each change.

1.3 Incident Reporting

The *Landsat Incident Reporting Procedure*, Section 1.5, outlines the detailed steps to be followed for reporting of significant anomalies and incidents to management. As indicated in the procedure, the Incident Reporting Process is closely tied to the CM process. All incident reports will be tracked in the LCCB's PVCS Version Manager (VM) Database.

1.4 Anomaly Management

As with incident reporting, Landsat Anomaly Management is closely tied with CM. All intersegment anomalies will be documented through Intersegment Problem Reports (IPRs) and/or Landsat Configuration Change Requests (LCCRs). The *Landsat Anomaly Management Plan*, Section 1.5, outlines the operational relationship between Program level Anomaly Management and CM.

1.5 Applicable Documents

1. Landsat Configuration Change Process.
2. Landsat Configuration Control Board (LCCB) Charter.
3. Landsat Incident Reporting Procedure.
4. Landsat Anomaly Management Plan.
5. Landsat Configuration Items Specification.

Section 2.0 - Configuration Management Organization

This section outlines the roles and responsibilities for the key members involved in the operations of Landsat CM process.

2.1 CM Roles and Responsibilities

Mission Management Office (MMO) Systems Engineer – The MMO Systems Engineer is responsible for the CM program employed by the Landsat Program. This includes:

a. Maintaining this CMP, *Landsat Configuration Control Process*, and *Landsat Configuration Control Board (LCCB) Charter* to ensure they reflect current CM processes and guidelines.
b. Implementing the procedures outlined the documents listed in above paragraph.
c. Ensuring that the personnel involved in the CM process are trained to perform their CM activities.
d. Establishing CM policies with the approval of the LCCB.
e. Facilitating the Landsat configuration change process and LITAP and LCCB meetings.
f. Ensuring that LITAP and LCCB members have appropriate technical knowledge and authority to enable resolution of the IPRs and LCCRs within the LITAP and LCCB.

LCCB Administrator – The LCCB Administrator supports the MMO Systems Engineer in the conduct of LCCB and LITAP activities and is responsible the following duties:

a. Tracking Landsat Intersegment Problems Reports (IPRs) and Landsat Configuration Change Requests (LCCRs). Updating them as appropriate in the CM tracking database.
b. Perform CM duties associated with Landsat document management as outlined in this CMP.
c. Monitoring and reporting the status of proposed and approved CM actions.
d. Scheduling and arranging LCCB meetings and developing and distributing the agenda.
e. Providing LCCB meeting minutes and action items.
f. Providing a monthly configuration status accounting to the LCCB and LITAP.

Landsat Mission Management Officer – The Landsat Mission Management Officer is responsible for:

a. Chairing LITAP meetings.
b. Filling in for the Program Manager at LCCB meetings when necessary.
c. Ensuring the CM practices outlined in this and related CM documents are followed.

Landsat Program Manager – The Landsat Program Manager is responsible for:

a. Ensuring that the LCCB and LITAP participants are trained in the objectives, procedures, and methods for performing the CM activities.

b. Chairing all LCCB meetings and authorizing all changes to configuration managed baselines.
c. Ensuring the CM practices outlined in this and related CM documents are followed.
d. Ensuring all CM positions are adequately staffed.

LITAP and LCCB Members – The detailed LITAP and LCCB members' duties are outlined in the *Landsat Configuration Control Board (LCCB) Charter*, Section 1.5.

Section 3.0 - Configuration Identification

The purpose of configuration identification is to uniquely identify each item within a system that management determines must be put under configuration control. The configuration identification process consists of the following activities.

a. Selecting the configuration items.
b. Assigning and applying unique identifiers to each selected item.
c. Organizing the items for ease of maintenance and control.
d. Establishing a baseline for the items by documenting their characteristics (form, fit and function) at a specified point in time.
e. Establishing and documenting a release process that provides users with the latest authorized version of a configuration item.

3.1 Configuration Item Selection

Selection of configuration items is a critical process because insufficient system detail results in inadequate control and excessive system detail results in inflexibility and lack of responsiveness to user requirements. A listing of Landsat Program configuration items is provided in the *Landsat Configuration Items Specification*, Section 1.5. This document is itself a configuration item and changes to it will be implemented and controlled through the change control process described in the *LCCB Configuration Control Process*, Section 1.5.

3.1.1 Software

Although the control of software configuration items is generally more appropriate for the lower tier CCBs. The LCCB configuration management process does allow for the management of mission level software items. Software and software related items are in several different forms and described below.

3.1.1.1 Applications Software

This is software for which the source code is available, thereby permitting code changes. The code is organized into groups of files, where each group performs a single, unique function. These groups of files are Configuration Items (CIs).

3.1.1.2 Commercial Off-the-Shelf (COTS) Software

This is software that has been purchased from a commercial vendor and is run under some type of licensing arrangement. No source code is available to the Program. However, each item of Commercial Off-the-Shelf (COTS) software is selected as a CI for version tracking.

3.1.1.3 Software Tools

Each software tool that can be modified and is available for use by more than a single software engineer will be designated as CI.

3.1.1.4 Databases

The databases listed in the *Landsat Configuration Items Specification*, Section 1.5 were selected as CIs to control and manage their unique configuration. The database field values are not

identified as CIs but are controlled via LCCB actions. Proposed changes to field values will be coordinated through the LCCB and LITAP via and LCCR. The LCCB may determine that the application of a documented and controlled procedure for routinely updating certain field values is sufficient to ensure proper control of the database configuration.

3.1.2 Hardware

As with software, control of hardware items is generally more appropriate for lower tier CCBs. Any identified hardware configuration items for the Landsat Program will be selected based on major hardware assemblies that perform a single, unique function. These include both operational hardware as well as spares. This hardware is listed in the *Landsat Configuration Items Specification*, Section 1.5.

3.1.3 Documentation

There are two major categories of documents that are selected as configuration items and put under configuration control. The first category is called Configuration Documents and consists of documents that define the functional and performance requirements and characteristics of other configuration items, i.e. requirements documents and interface control documents. The second category consists of any other document requiring change control, but the document does not define another configuration item. Examples include policy directives, plans, and agreements. The LCCB Administrator in conjunction with the each Document Administrator, "Book Boss", will maintain the electronic library for configuration controlled documents. This library is maintained within the LCCB Version Manager (VM) system. The latest released version, of those documents appropriate for public access, will be placed on the LCCB web page.

3.1.4 Configuration Identifiers

Once selected, each configuration item will be given a unique identifier.

3.2 Establishing and Modifying Baselines

The initial LCCB baseline for all configuration items is established at the time the LCCB closes the LCCR associated with the item to be baselined. This baseline will not change without a LCCR being generated and approved by the LCCB.

Section 4.0 - Interface Management

An interface exists any time information or data flows between a device belonging to one segment and a device belonging to one or more other segments. All intersegment interfaces will be controlled through formal Interface Control Documents (ICDs) that are subject to LCCB approval. The affected segments will adhere to the guidelines set forth in the applicable ICD(s).

Section 5.0 - Configuration Control

Configuration control is the systematic proposal, justification, evaluation, coordination, approval or disapproval, and implementation of proposed changes for a configuration item after the establishment of the baseline for the configuration item. These configuration items may be hardware, software, database, or documentation. A flowchart and description of the entire LCCB configuration control process is provided in the *LCCB Configuration Change Process*, Section 1.5.

5.1 Change Classifications

Proposed changes to baselined configuration items are documented as a Landsat Configuration Change Request (LCCR). LCCRs are classified by the following guidelines:

- Affects the operational baseline in two or more operational segments.
- Affects any product that travels from one segment to another or to the outside users.
- Affects any service provided by one segment to another or to the outside users.
- Affects any system-level or inter-segment interface, plan, specification or requirement.
- Requires revision of Landsat operational mission objectives and/or funding.
- Affects program, system, or mission safety.
- Requires the modification of any agreement between the Program and an outside agency.

5.2 Change Request Priorities

LCCRs and IPRs will be prioritized as follows:

- EMERGENCY: Operations are at a halt. No workaround is possible. Delivery of a fix is required immediately in order to resume operations.
- URGENT: Operations are hampered but an acceptable workaround can be implemented. Delivery of a fix should occur within one month of LCCB approval.
- ROUTINE: Proposed change is not mission critical. These changes may be minor corrective actions or enhancements.

Section 6.0 - Configuration Status Accounting

This section documents the procedure used by the LCCB to record and report the status of its configuration items.

6.1 Configuration Status Report

The LCCB Administrator prepares a standard report each month that documents the LCCB configuration management activities and presents it to the LCCB and LITAP during regularly scheduled meetings. This report contains at least the following information:

- The number of "open" LCCRs.
- The number of "closed" LCCRs.
- The status of each "open" LCCR.
- The schedule for upcoming CM activities.

Section 7.0 - Configuration Audits

Configuration audits are conducted to verify that the LCCB configuration item baselines conform to the documentation that define them and to ensure compliance with the CM standards and procedures. There are three types of configuration audits conducted by the LCCB: Functional Configuration Audits (FCAs), Physical Configuration Audits (PCAs), and Quality Assurance Audits.

7.1 Functional Configuration Audits

Functional Configuration Audits (FCA) are scheduled and conducted by the LCCB Administrator to verify that a configuration item's performance is as specified in its configuration documentation. FCAs are normally conducted only after a LCCR has been implemented. The LCCB Administrator or representative reviews the results of LCCR testing to validate that the configuration item's performance has not changed as a result of the LCCR or that any performance change caused by the LCCR has been documented as appropriate.

7.2 Physical Configuration Audits

Physical Configuration Audits (PCA) are scheduled and conducted by the LCCB Administrator to verify that the as-built or as-coded configuration of a configuration item is as specified in its design documentation. PCAs are conducted after a LCCR has been implemented. The LCCB Administrator or representative reviews engineering drawings, specifications, technical data, test results, design documents, listings, and any other pertinent documents and compares them to the operational version of the configuration item.

7.3 Quality Assurance Audits

Quality Assurance Audits are conducted by an individual or group designated by the MMO Systems Engineer to evaluate the Program's compliance with this CMP and to verify CM policies, procedures, and practices are being followed.

7.4 Audit Records

The auditor records the results of configuration audits in a post-audit report and the LCCB Administrator maintains that report. This report specifies the items audited, audit findings, and corrective actions to be taken. The LCCB Administrator will track all change requests to closure. The CM Manager also reviews the results of all audits with the MMO Systems Engineer.

Section 8.0 - Document Management

8.1 Public and Internal Documentation Control

It is the LCCB's intent to post the latest copy of configuration controlled, public access documentation on the web. Documents available on the web will be posted in PDF format. For security reasons, documents that are not appropriate for public access will not be posted. The *Landsat Configuration Items Specification* will indicate whether a document will be made available to the public or not. Internal documents will be accessed through PVCS Version Manager (VM) only.

8.2 Document Administrator

Although each document will have a designated Administrator, PVCS VM accounts will only be given to a limited group of personnel. Document Administrators without VM access will check in and check out the latest version of their assigned document(s) through the LCCB Administrator. Those with VM access will be able to check documents in and out of VM directly.

8.3 Document Control Numbers (DCN)

All documents under LCCB configuration control will be assigned a Document Control Number (DCN) in the configuration items specification. The LCCB Administrator will assign all DCNs.

8.4 Revision Control Numbers (RCN)

The RCN will consist of two parts: subsystem-sequential number. Revisions will be noted by a decimal and a revision number afterwards. For example, ICD-01.1 is Revision 1 of that document.

8.5 Naming Convention for VM Archives

The naming convention for configuration controlled documents stored in VM archives will be as follows:

[DCN] [Document title]

For example:
ICD-01 Interface Control Document Between the MMO and MOC

Common acronyms may be used in the archive name.

8.6 Requirements for Title Pages and Footer

The title page of a configuration controlled document must include the title, revision, date of revision and DCN. The DCN must be placed in the top right corner.

The footer for configuration controlled documents must be as follows:

Heading Number-Page Number (centered) RCN (right justified)

8.7 Title and Signature Pages

All LCCB documentation will contain a signature page, with the exception of internal process and procedure documents.

The LCCB Administrator will maintain the original title page and signature page for each document. The Document Administrator will provide the LCCB Administrator with the title and original signed signature page of the document. The Administrator will retain only the hardcopy title and signature pages. The document as a whole will be maintained electronically only. The PVCS VM archives and signature page file are sufficient to recover a complete copy of the original.

8.8 Document Signatures

The following is a recommended list of those who should sign documentation. Only include those that apply to the document to be signed.

- Author
- Representative from all affected parties (generally for ICDs only).
- Technical reviewers – MMO Systems Engineer at a minimum.
- Mission Management Officer – approval for all internal documents.
- Landsat Program Manager – approval for all external documents (agreements with other agencies, other Programs, etc).

8.9 Change Pages

The LCCB will not support change pages. The documents are available electronically and changes can be made easily. Changes can also be marked and sent to reviewers online using MS Word's revision marks feature.

8.10 Establishing and Updating Document Baselines

When a new document needs to be baselined or an existing document needs to be updated, the Document Administrator will submit a LCCR. If the Document Administrator does not have VM access, they will request the latest version from the LCCB Administrator; otherwise, the Document Administrator will check out the document from VM directly and update it in accordance with the LCCR.

The Document Administrator will then update the document and provide the updated version for peer review to the appropriate LITAP and LCCB representatives, engineers or managers. After the peer review issues are resolved and the final version is presented at the LITAP and approved by the LCCB for closure, the document will be signed. The LCCB Administrator will then check the document into VM, post the "PDF" version to the web, and file the title and signature pages. If the Document Administrator has VM access, they will contact the LCCB Administrator after the document is checked into VM at which point the LCCB Administrator will generate the PDF and post it. The Document Administrator will provide the title and signature pages to the LCCB Administrator for filing.

Appendix A - Abbreviations and Acronyms

CCB	Configuration Control Board
CCR	Configuration Change Request
CI	Configuration Item
CM	Configuration Management
CMP	Configuration Management Plan
CMP	Configuration Management Plan
COTS	Commercial Off-the-Shelf
DAAC	Distributed Active Archive Center
DCCB	DHF Configuration Control Board
DCN	Document Control Number
DHF	Data Handling Facility
EDC	EROS Data Center
EOS	Earth Observing Systems
EROS	Earth Resources Observation System
ESMO	Earth Science Mission Operations
FCA	Functional Configuration Audit
GN	Ground Network
IAS	Image Assessment System
ICD	Interface Control Document
IPR	Intersegment Problem Report
LCCB	Landsat Configuration Control Board
LCCR	Landsat Configuration Change Request
LGS	Landsat 7 Ground System
LITAP	Landsat Intersegment Technical Assessment Panel
LPGS	Landsat 7 Product Generation System
LPS	Landsat 7 Processing System
LPSO	Landsat Project Science Office
MDS	MMO Database System
MMO	Mission Management Office

MOC	Mission Operations Center
NASA	National Aeronautics and Space Administration
NLAPS	National Land Archive Processing System
PCA	Physical Configuration Audit
PDF	Portable Document Format
PDS	Product Distribution System
PVCS	Program Version Control System
RCN	Revision Control Number
TDRSS	Tracking and Data Relay Satellite System
USGS	U.S. Geological Survey

Appendix B - Glossary

Audit: A review performed to confirm that a system, its subsystems, and all its configuration items are accurately described in documentation, do not include any unauthorized changes.

Baseline: The approved functional and physical components of a hardware and software system, at a specific point in its life cycle that is described in approved controlled documentation.

Configuration: The baseline functional and physical characteristics of software, firmware, and hardware, or a combination thereof, as set forth in documentation and achieved in a product.

Configuration Accounting: The activity that produces records and reports of CI descriptions and all changes.

Configuration Change Request (CCR): A document that requests and justifies a change to a configuration item.

Configuration Control: Configuration control is the systematic proposal, justification, evaluation, coordination, approval or disapproval, and implementation of proposed changes for a configuration item after the establishment of the baseline for the configuration item. These configuration items may be hardware, software, database, or documentation.

Configuration Documentation: The technical documentation that identifies and defines the item's functional and physical characteristics.

Configuration Identification: The technical documentation and processes that identify and describe items subject to configuration control.

Configuration Items (CI): The individual software, hardware and document products or components, which are identified by the project as requiring control and monitoring.

Configuration Management (CM): The process of organizing, tracking, controlling, auditing, establishing a baseline, and accounting for configured items. The systematic control and evaluation of all changes to a project's baseline. CM consists of Configuration Identification, Configuration Control, Configuration Status and Accounting, and Configuration Audits.

Configuration Status Accounting: The recording and reporting of information needed to manage configuration items effectively, including:

a. A record of the approved configuration documentation and identification numbers.
b. The status of proposed changes, deviations, and waivers to the configuration.
c. The implementation status of approved changes.
d. The configuration of all units of the configuration item in the operational inventory.

Data Management: The control of information so that changes are intentional, traceable, and previous versions can be determined.

Deviation: An authorization to produce an item that departs from a particular requirement of its approved configuration for a specified number of units or a specific period of time.

Documentation: All written or drawn representations of the system required to define the system or any part of the software or hardware.

Fit: The ability of an item to physically interface or interconnect with or become on integral part of another item.

Form: The shape, size, dimensions, mass, weight, and other visual parameters which uniquely characterize an item. For software, form denotes the language and media.

Function: The action or actions that an item is designed to perform.

Functional Configuration Audit (FCA): The formal examination of functional characteristics of a configuration item, prior to acceptance, to verify that the item has achieved the requirements specified in its configuration documentation.

Interface: The functional and physical characteristics required to exist at a common boundary.

Interface Control: The process of identifying, documenting, and controlling all functional and physical characteristics relevant to the interfacing of two or more items provided by one or more organizations.

Interface Control Documentation: Interface control drawing or other documentation, which depicts physical and functional interfaces of related or co-functioning items.

Physical Configuration Audit (PCA): The formal examination of the "as-built" configuration of a CI against its technical documentation to establish or verify the configuration item's product baseline.

Procedure: A document that specifies the steps needed to accomplish a particular process.

Quality Assurance: The process of ensuring that a product has been produced on schedule, within budget, and within the constraints specified by the customer, and that it functions or performs correctly.

Revision: A change to or instance in the evolution of a single file, usually a source file. Compare with version.

Software baseline: The software system at a specified point in time.

Version: An instance in the evolution of a software application. Compare with revision.

Waiver: An authorization to accept a CI that departs from specific requirements but considered suitable for use "as is" or after rework by an approved method.